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EXAMINER

HOGANS, DAVID L

| ART UNIT | PAPER NUMBER |
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2813

DATE MAILED: 01/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-------------------------------|-------------------------------|--|
| Office Action Summary | Application No. 09/986,107 | Applicant(s) GULVIN ET AL. | |
| | Examiner David L. Hogans | Art Unit 2813 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-22 and 24-32 is/are pending in the application.
- 4a) Of the above claim(s) 1-17 and 33-36 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18-22 and 24-31 is/are rejected.
- 7) ☒ Claim(s) 32 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11-07-01 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the Election Requirement filed on November 20, 2003.

Election/Restrictions

1. Applicant's election with traverse of Claims 18-22 and 24-32 in Paper No. November 20, 2003, is acknowledged. The traversal is on the ground(s) that a membrane cannot be formed without utilizing a sacrificial layer between the first micromachined layer and the second micromachined layer. This is not found persuasive because Applicant relies on an element not recited within Claim 33 (i.e. – a sacrificial layer). The scope of Claim 33 merely encompasses a first layer forming a membrane and a second layer directly adjacent with at least one cut therein. To form a device within the scope of Claim 33, one need not form a sacrificial layer (an element not recited in Claim 33) between first and second layers. Additionally, the Examiner notes that there could be a void beneath the first layer, thereby, creating a membrane of the first layer. Finally, the Examiner notes that Claims 1 and 18 have acquired a separate status within the art from Claims 16 and 33, by their different classification, and consequently, restriction for examination purposes is proper.

Additionally, the Applicant traverses on the ground(s) that point defects, dislocations or gross defects cannot be used to control the strength gradient within a layer of a membrane for a micro-device. This is not found persuasive because Applicant relies on elements not recited within the body of Claim 16 (i.e. – a membrane for a micro-device). The limitation of a membrane for a micro-device is in the preamble,

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and as the body of the claim makes no reference or allusion to a membrane for a micro-device, it is not accorded any patentable weight. Accordingly, the scope of Claim 16 merely encompasses a layer with upper and lower portions with approximately similar first and second strength gradients. As such, the method proposed by the Examiner could produce such a layer. Finally, the Examiner notes that Claims 1 and 18 have acquired a separate status within the art from Claims 16 and 33, by their different classification, and consequently, restriction for examination purposes is proper.

The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on November 7, 2001, has been considered and placed in the record of file.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 25-27 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. Removing the second layer of second material prior to removing the protective layer is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). The Examiner is uncertain how the protective layer may be removed without removing the second layer of second material first because the specification provides no disclosure.

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5. Claims 26 and 27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification fails to teach removing the protective layer by mechanical or chemical means.

6. Claims 29 and 31 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification fails to teach forming the protective layer of polysilicon or single crystal silicon.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 25-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 25 depends from a cancelled claim, and as such, the scope of the claim cannot be ascertained. The Examiner assumes Claim 25 depends from Claim 24. See MPEP § 608.01(n)

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 18, 19 and 21-22 are rejected under 35 U.S.C. 102(b) as being anticipated by 4,740,410 to Muller et al.

In reference to Claims 18 and 19, Muller et al. teaches:

- forming a first layer of a first material (24 or 25) (See Figures 3-8 and columns 4-5 lines 13-55);
- forming a first layer of polysilicon structural material (26) over the first layer of the first material (See Figures 3-8 and columns 4-5 lines 13-55);
- forming at least one cut (27) in the first layer of structural material (See Figures 3-8 and columns 4-5 lines 13-55);
- forming a first layer of a sacrificial material (28), less resistant to removal than the first material, over the first layer of structural material such that an interface (i.e. – the sidewall of first material (25) interfaces sacrificial material (28)) is created between the first material and the sacrificial material at the at least one cut in the first layer of structural material (See Figures 3-8 and columns 4-5 lines 13-55);
- forming a second layer of structural material (30) over the first layer of sacrificial material (See Figures 3-8 and columns 4-5 lines 13-55); and
- subjecting the first layer of sacrificial material to a release etch to remove the

first layer of the sacrificial material (See Figures 3-8 and columns 4-5 lines 13-55)

The Examiner has not given patentable weight to the preamble limitation of "a membrane of a structural material for a micro-device" because "[A] claim preamble has the import that the claim as a whole suggests for it". *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995) "If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is 'necessary to give, life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim." *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999). As the body of the claim makes no reference, nor allusion, to a membrane of a structural material for a micro-device (i.e. - the preamble does not recite limitations of the claim), and since the above referenced preamble limitation does not give life or meaning to the claim, it is deemed to be of no patentable weight. See MPEP § 2111.02

In reference to Claim 21, Muller et al. teaches:

- wherein the at least one cut in the first layer of structural material comprises forming at least one channel (27) (See Figures 3-8 and columns 4-5 lines 13-55)

The Examiner notes that Merriam Webster's Collegiate Dictionary (2001), Tenth Edition, defines channel as a "conduit". As the cut in structural layer (26) provides a conduit between layers, it acts as channel.

In reference to Claim 22, Muller et al. teaches:

- forming the first layer of the first material (24) comprises forming a first layer of nitride (See Figures 3-8 and columns 4-5 lines 13-55); and
- forming the first layer of the sacrificial material comprises forming a first layer of oxide

The Examiner notes that layer 24, comprised by silicon nitride, acts as the first layer of the first material.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over 4,740,410 to Muller et al. in view of US 2003/0071015 to Chinn et al.

Incorporating all arguments of Claim 18 and noting that Muller et al. fails to explicitly teach wherein forming the first layer of structural material comprises forming a layer of single crystal silicon.

However, Chinn et al., on page 2 paragraph [0036], teaches that structural layers can be comprised by crystalline silicon.

It would have been obvious to one of ordinary skill in the art to modify Muller et al. by incorporating a structural material comprised by crystalline silicon, as taught by Chinn et al., to form a micro-electro-mechanical device that does not display stiction.

Furthermore, the specification contains no disclosure of either the critical nature of the claimed process or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

14. Claim 18 is rejected under 35 U.S.C. 102(e) as being anticipated by US 2003/0152815 to LaFollette et al.

In reference to Claim 18, LaFollette et al. teaches:

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- forming a first layer of a first material (30) (See Figures 1 and 2 and paragraphs [0164] to [0171]);
- forming a first layer of structural material (34 and 34') over the first layer of the first material (See Figures 1 and 2 and paragraphs [0164] to [0171]);
- forming at least one cut (i.e. – the photoresist patterns the first microscopic electrode) in the first layer of structural material (See Figures 1 and 2 and paragraphs [0164] to [0171]);
- forming a first layer of a sacrificial material (38), less resistant to removal than the first material, over the first layer of structural material such that an interface is created between the first material and the sacrificial material at the at least one cut in the first layer of structural material (See Figures 1 and 2 and paragraphs [0164] to [0171]);
- forming a second layer of structural material (40) over the first layer of sacrificial material (See Figures 1 and 2 and paragraphs [0164] to [0171]); and
- subjecting the first layer of sacrificial material (38) to a release etch (38') to remove the first layer of the sacrificial material (See Figures 1 and 2 and paragraphs [0164] to [0171])

The Examiner has not given patentable weight to the preamble limitation of “a membrane of a structural material for a micro-device” because “[A] claim preamble has the import that the claim as a whole suggests for it”. *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995) “If the claim preamble, when read in the context of the entire claim, recites limitations of the claim,

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or, if the claim preamble is 'necessary to give, life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim." *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999). As the body of the claim makes no reference, nor allusion, to a membrane of a structural material for a micro-device (i.e. - the preamble does not recite limitations of the claim), and since the above referenced preamble limitation does not give life or meaning to the claim, it is deemed to be of no patentable weight. See MPEP § 2111.02

15. Claims 18, 24, 28 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by 6,587,613 to De Natale.

In reference to Claim 18, De Natale teaches:

- forming a first layer of a first material (60a) (See Figure 4 and columns 6-8 lines 50-45);
- forming a first layer of polysilicon structural material (element 62 within layer 60b) over the first layer of the first material (See Figure 4 and columns 6-8 lines 50-45);
- forming at least one cut (i.e. – the areas within layer 60b not containing polysilicon) in the first layer of structural material (See Figure 4 and columns 6-8 lines 50-45);
- forming a first layer of a sacrificial material (element 64 within layers 60b and 60c), less resistant to removal than the first material, over the first layer of

structural material such that an interface is created between the first material and the sacrificial material at the at least one cut in the first layer of structural material (See Figure 4 and columns 6-8 lines 50-45);

- forming a second layer of structural material (elements 62 and 66 within layers 60c and 60d) over the first layer of sacrificial material (See Figure 4 and columns 6-8 lines 50-45); and
- subjecting the first layer of sacrificial material (element 64 within layers 60b and 60c) to a release etch to remove the first layer of the sacrificial material (See Figure 4 and columns 6-8 lines 50-45)

The Examiner has not given patentable weight to the preamble limitation of “a membrane of a structural material for a micro-device” because “[A] claim preamble has the import that the claim as a whole suggests for it”. *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995) “If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is ‘necessary to give, life, meaning, and vitality’ to the claim, then the claim preamble should be construed as if in the balance of the claim.” *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999). As the body of the claim makes no reference, nor allusion, to a membrane of a structural material for a micro-device (i.e. - the preamble does not recite limitations of the claim), and since the above referenced preamble limitation does not give life or meaning to the claim, it is deemed to be of no patentable weight. See MPEP § 2111.02

In reference to Claims 24, 28 and 29, De Natale teaches:

- forming a second layer of sacrificial material (element 64 within layer 60d) over the second layer of structural material (i.e. - element 62 within layer 60c) (See Figures 4-9 and columns 6-8 lines 50-45);
- forming a polysilicon protective layer (layer 70 adjacent to layer 60d) over the second layer of the sacrificial material (See Figures 4-9 and columns 6-8 lines 50-45);
- forming at least one cut in the protective layer (i.e. – noting the oxide filled areas that traverse layer 70 from its top surface to layer 60d) (See Figures 4-9 and columns 6-8 lines 50-45);
- forming a second layer of a second material (the oxide portion of layer 70) over the protective layer such that an interface is created between the second layer of the second material and the second layer of sacrificial material at the at least one cut in the protective layer (See Figures 4-9 and columns 6-8 lines 50-45); and
- subjecting the second layer of the sacrificial material to the release etch to remove the second layer of the sacrificial material (See Figures 4-9 and columns 6-8 lines 50-45)

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6,587,613 to De Natale in view of US 2003/0071015 to Chinn et al.

Incorporating all arguments of Claims 18 and 24 and noting that De Natale fails to explicitly teach wherein forming the first layer of structural material comprises forming a layer of single crystal silicon.

However, Chinn et al., on page 2 paragraph [0036], teaches that structural layers can be comprised by crystalline silicon.

It would have been obvious to one of ordinary skill in the art to modify De Natale by incorporating a structural material comprised by crystalline silicon, as taught by Chinn et al., to form a micro-electro-mechanical device that does not display stiction.

Furthermore, the specification contains no disclosure of either the critical nature of the claimed process or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Allowable Subject Matter

18. Claims 25-27 and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

19. The following is a statement of reasons for the indication of allowable subject matter.

With regards to Claims 25-27, the prior art fails to teach, in combination with other claimed features, removing the protective layer after subjecting the first and second layer of sacrificial material to a release etch.

With regards to Claim 32, the prior art fails to teach, in combination with other claimed features, forming the first layer of first material and the second layer of second material from a layer of nitride.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (703) 305-3361 or (571) 272-1691, after February 9, 2004. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (703) 308-4940. The fax phone

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number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

dh


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800